Importance Of Grazing Management In Improving Water Use Efficiency of Pastures with Tropical Forage Grasses

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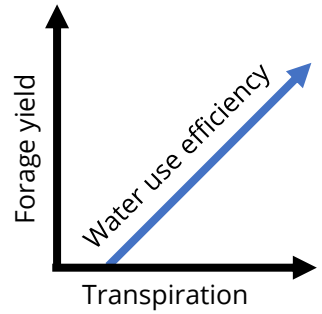
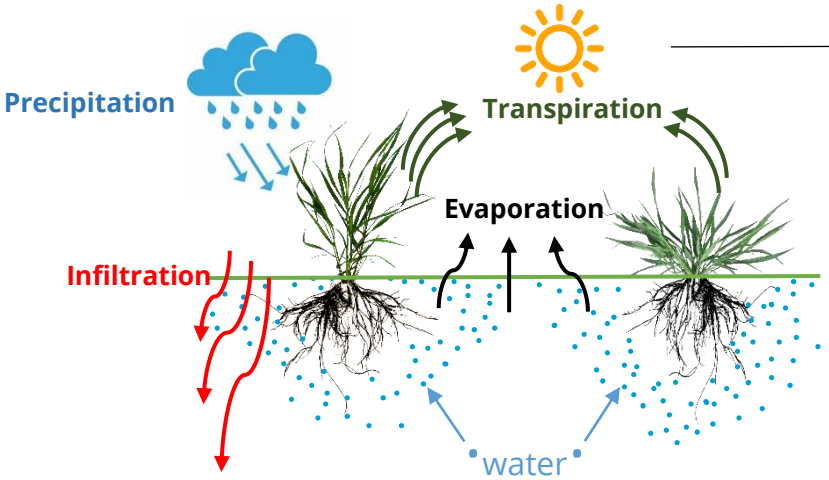
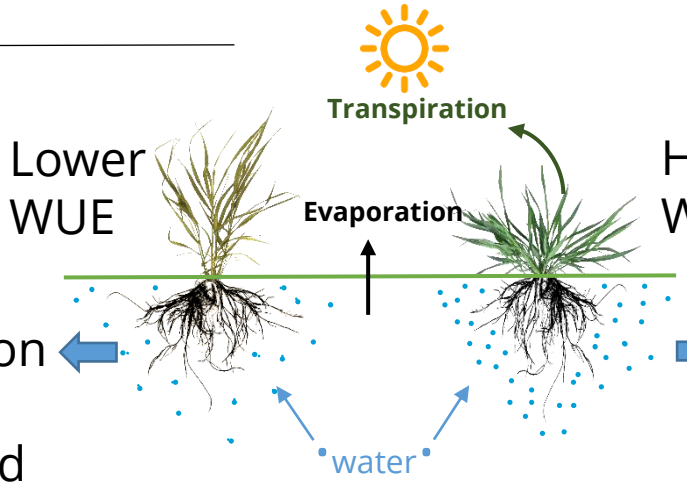
Why?

- Water use efficiency (WUE) is a plant trait sought to improve drought resistance







Faster dessication under prolonged drought

More water saved in soil for later use

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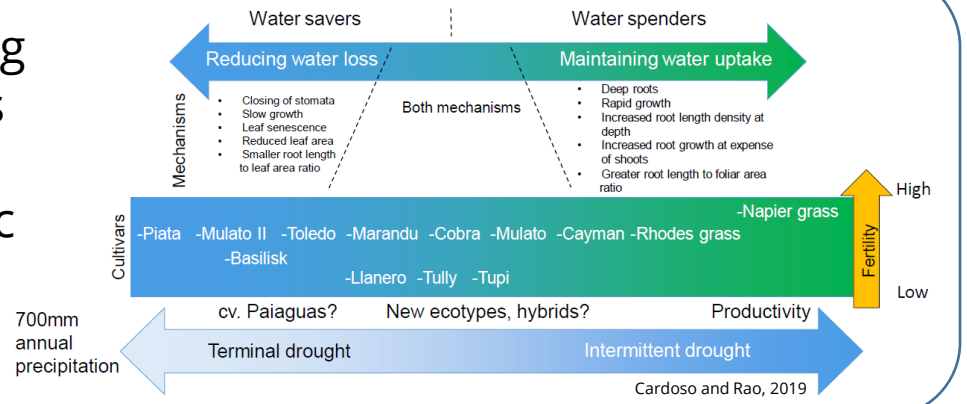
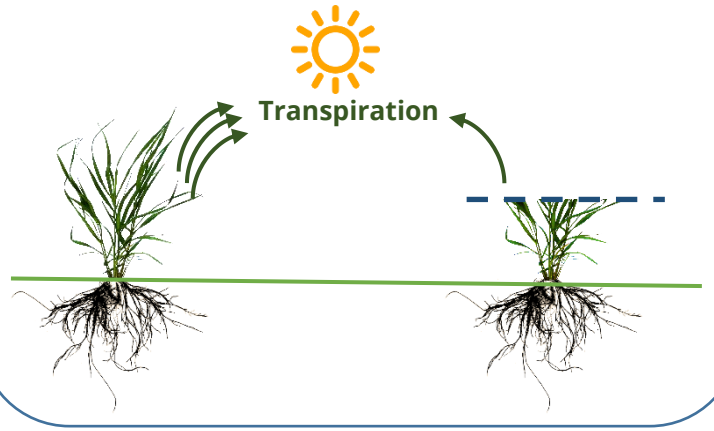
How to improve water use efficiency in pastures?

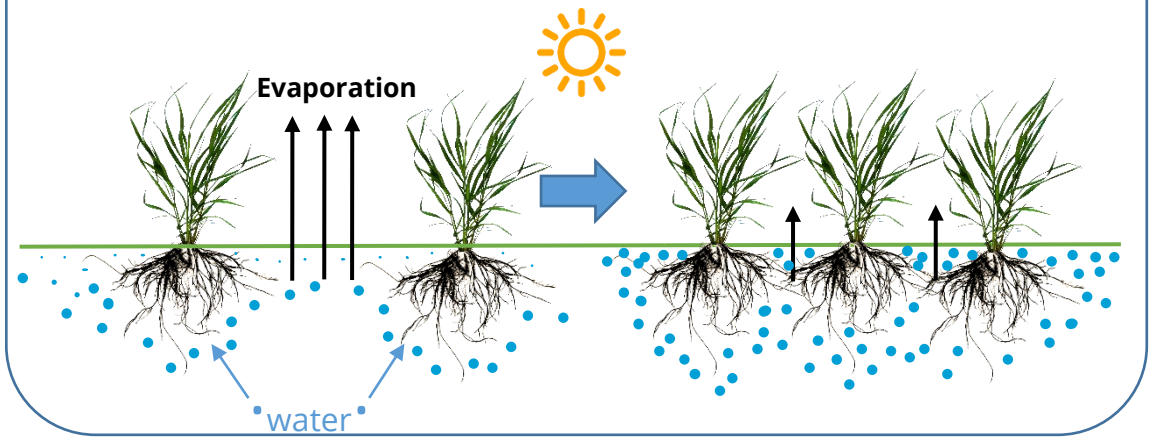
By using grasses with intrinsic high WUE



Reducing transpiration area



Minimizing evaporation from soil



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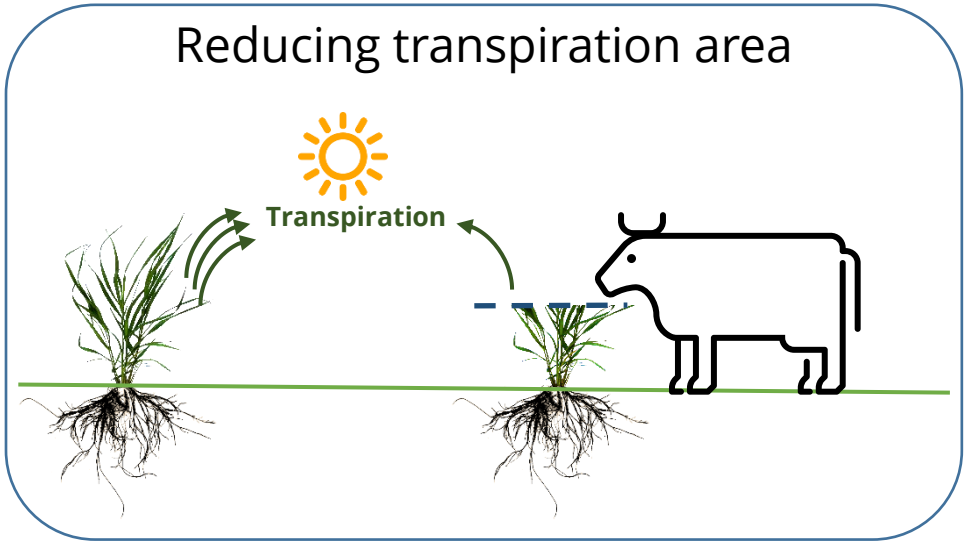
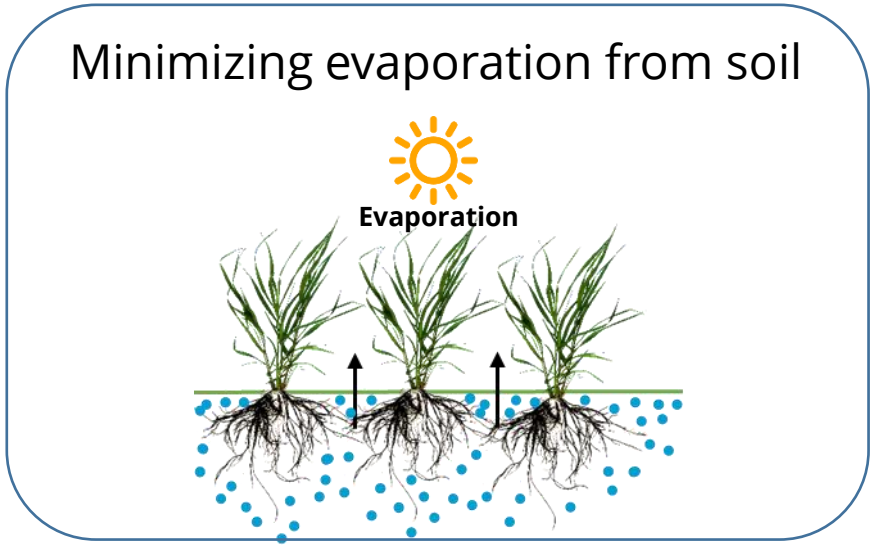
How grazing management can improve water use efficiency (WUE) in pastures?

- Grazing management of pastures planted with tropical forage grasses can improve WUE values if it moderates the process of evapotranspiration





Objective

- **To study changes in WUE by simulated grazing under greenhouse conditions in a set of forage grasses commonly used in the tropics (*Cenchrus ciliaris*, *Chloris gayana*, *Megathyrsus maximus*, *Urochloa* spp.) under well-watered and water-limited conditions**

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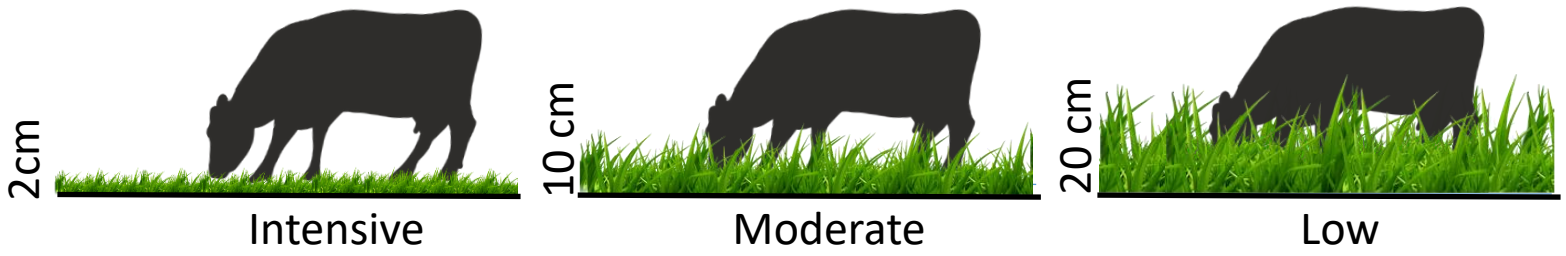
Materials and methods

- *Urochloa humidicola* cv. Tully
- *U. brizantha* cv. Piata
- *U.* hybrid cv. Mulato II
- *Megathyrsus maximus* cv. Mombaza
- *M. maximus* cv. Sabanera
- *Chloris gayana* ILRI-645,
- *Cenchrus ciliaris* ILRI-10097

- Two watering conditions (well-watered and water-limited)

- Three grazing intensities, every 25 days for 100 days



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Results

	Dry mass forage (g plant^{-1})					
	Well-watered			Water-limited		
	Grazing intensity			Grazing Intensity		
	Low	Moderate	High	Low	Moderate	High
U. humidicola cv. Tully	39.8bc	32.3b	30.3b	22.3b	24.7bc	14.1a
M. maximus cv. Sabanera	83.5g	67.5e	62.2e	30.1bc	43.6d	22.5a
M. maximus cv. Mombaza	99.1h	81.9g	75.5f	29.7bc	47.5e	21.5b
C. gayana ILRI-645	67.7e	53.1d	47.9cd	26.1c	37.0d	25.7c
U. brizantha cv. Piata	55.8d	47.7cd	44.1c	28.4c	36.4d	23.8c
U. hybrid cv. Mulato II	54.5d	50.7d	41.8c	29.9bc	37.1d	25.6bc
C. ciliaris ILRI-10097	33.2b	27.0a	24.5a	19.1ab	24.7bc	18.3ab
Average	60.5e	51.5d	46.6c	26.5c	35.9d	21.6ab

- High grazing intensity resulted in greater forage yield under well-watered conditions, but lower forage yield under water-limited conditions

	Leaf rolling scores			Dead leaf dry mass (g plant^{-1})		
	Water-limited			Water-limited		
	Grazing intensity			Grazing Intensity		
	Low	Moderate	High	Low	Moderate	High
U. humidicola cv. Tully	3c	1a	1a	2.6e	0.4ab	0.3a
M. maximus cv. Sabanera	5e	2b	3c	3.2g	0.3a	0.2a
M. maximus cv. Mombaza	5e	2b	3c	5.1f	1.2c	1.0c
C. gayana ILRI-645	5e	2b	2b	2.4e	1.1c	0.5ab
U. brizantha cv. Piata	4d	2b	3c	0.8bc	0.3a	0.3a
U. hybrid cv. Mulato II	4d	2b	3c	1.4cd	0.5ab	0.2a
C. ciliaris ILRI-10097	3c	1a	2b	0.5ab	0.1a	0.1a
Average	4d	2b	2.4b	2.3e	0.6ab	0.4ab

- Plants under low grazing intensity showed greater symptoms of stress under water-limited conditions

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Results

	Water Use Efficiency (g plant biomass/liter of water consumed)					
	Well-watered			Water-limited		
	Grazing intensity			Grazing Intensity		
	Low	Moderate	High	Low	Moderate	High
U. humidicola cv. Tully	6.0abc	6.2abc	5.8ab	2.2c	3.2e	2.7d
M. maximus cv. Sabanera	5.3a	5.5a	5.4a	2.0bc	3.0de	1.1a
M. maximus cv. Mombaza	5.5a	5.4a	5.5a	1.5ab	2.5cd	1.4ab
C. gayana ILRI-645	5.9ab	5.9ab	6.0abc	1.5ab	2.5cd	1.0a
U. brizantha cv. Piata	6.3bcd	6.8cd	6.5bcd	2.5cd	3.5ef	1.0a
U. hybrid cv. Mulato II	5.9ab	6.0abc	5.9ab	1.8bc	2.8d	1.5ab
C. ciliaris ILRI-10097	6.7cd	7.1d	7.4d	3.1de	4.1g	3.1de
Average	5.9ab	6.1abc	6.1abc	2.1c	3.1e	1.7b

- Plants under moderate grazing intensity showed greater WUE

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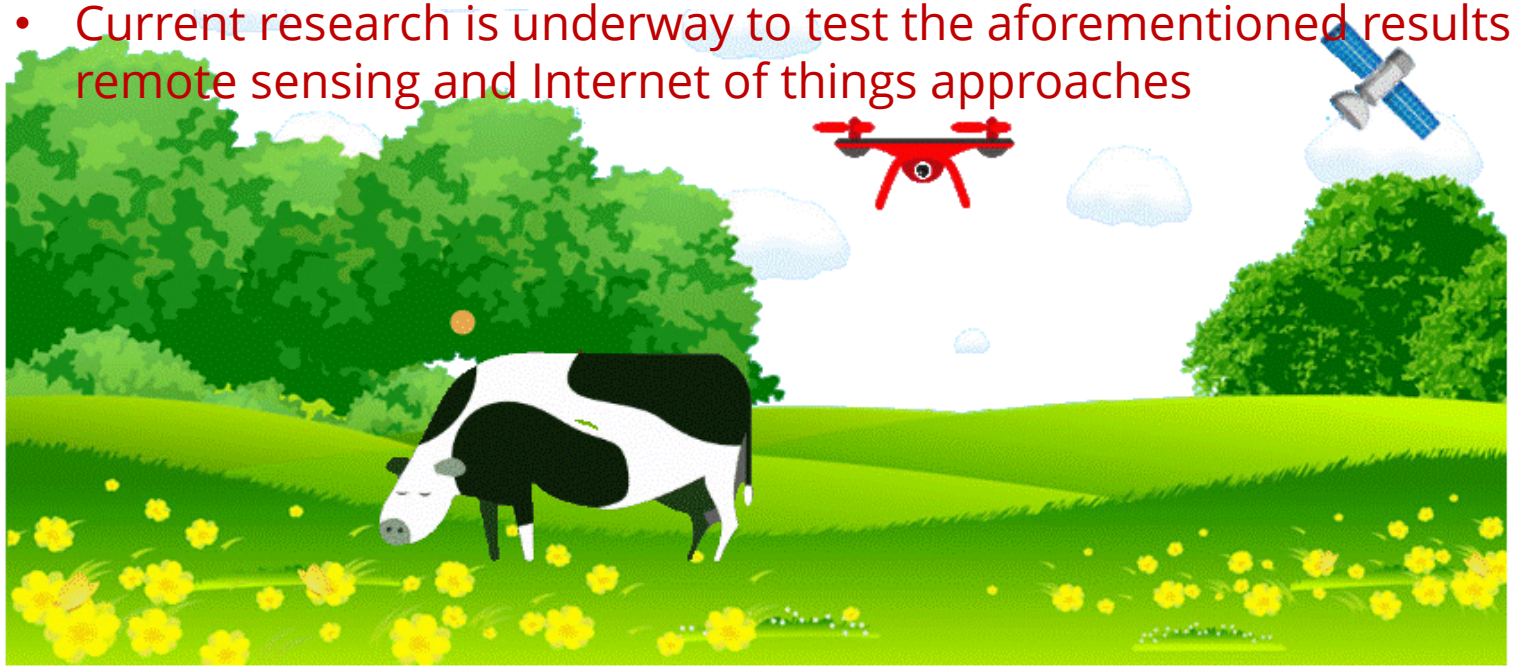
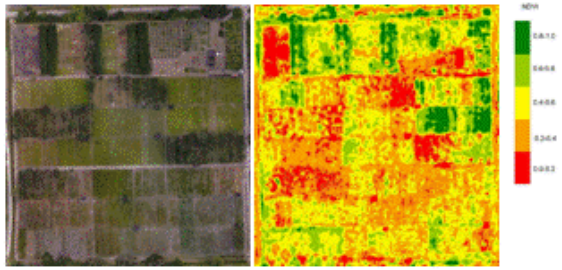
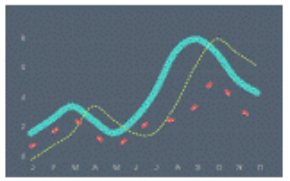
Conclusions

- WUE of forages can be improved by managing leaf area size
- Moderate grazing management shows promise for mitigating the impacts of drought events and improve resiliency of pastures planted with tropical grasses.
- Current research is underway to test the aforementioned results under field conditions using remote sensing and Internet of things approaches







Thanks everyone

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